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DEVELOPING A PRODUCT CLASSIFICATION SYSTEM FOR THE UNITED STATES

Background

On April 9, 1997, the Office of Management and Budget (OMB) announced its decision to adopt the North American Industry Classification System (NAICS) to replace the 1987 Standard Industrial Classification (SIC) system. NAICS was developed by the Economic Classification Policy Committee, established by the OMB to restructure the SIC, in cooperation with Statistics Canada and Mexico's Instituto Nacional de Estadística, Geografía e Informática (INEGI).

NAICS is based on the economic concept that establishments using the same production processes to produce a good or service should be grouped together. This production-based system is unique among classification systems because it was designed around a central organizing principle, that is a production-based economic concept.

In developing NAICS, the statistical agencies of the three countries agreed that the "uses of industrial statistics which include measuring productivity, unit labor costs, and the capital intensity of production require that information on outputs and inputs be used together. Morever, statistical agencies in the three countries expect to be called upon to produce information on inputs and outputs, industrial performance, productivity, unit labor costs, employment, and other statistics in order to analyze the effects of the North American Free Trade Agreement.' An industry classification system erected on a production-oriented, or supply-based, conceptual framework will assure maximum usefulness of industrial statistics for these and other purposes."[1]

That same agreement recognized a critical need for the development of a commodity classification system and noted that "market-oriented, or demand-based, groupings of economic data are required for many purposes, including studies of market share, demands for goods and services, import competition in domestic markets, and similar studies." [2] The three agencies agreed to work cooperatively to help improve existing commodity classification systems such as the Harmonized System (HS) of the Customs Cooperation Council and the United Nations' Provisional Central Product Classification (CPC) system and to explore the possibility of developing a product system in common.

The ECPC began preliminary work on establishing a product classification system in 1995. However, that work was delayed until after 1997 because the total restructuring of the industry classification system appropriated all available resources within the statistical agencies. The ECPC, acting on behalf of the OMB, plans to begin work on a product classification system shortly.

This paper outlines different approaches to developing a commodity classification system and discusses each in detail.

Demand-Based Product Classification System

The first approach, the demand-side concept, was thoroughly reviewed in an ECPC Issue Paper (Issues Paper 1) that was published in the Federal Register, Vol. 58, No. 60, Wednesday, March 31, 1993, pp. 16991-17000. Below are excerpts from that paper.

> "The demand-side concept in intuitively more understandable than is the supply-side concept, but, at the same time, is technically more difficult to define. Under a demand-side concept, one would group together commodities or services that have similarities in use, that belong together or are used together for some purpose, or that define market groupings.
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> A quite old idea is that demand groupings can be formed by considering the nature of substitutions. Very close substitutes belong together; commodities or services that are not good substitutes belong in different categories. Granulated cane sugar and granulated beet sugar, for example, are probably indistinguishable in use (they are perfect substitutes) and accordingly belong together on the close-substitutes rule. The close substitutes method is sometimes known as the "gaps in nature" approach: To define demand-side categories one looks for pronounced gaps in the chain of substitutes. Empirically, finding gaps in the substitute chain has proven difficult.
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> A somewhat related idea is examining the movement of prices. If the prices of two goods move together, then they may be combined in a demand-side category. This is often known as "Hicksian aggregation," because it appeared in the work of Nobel laureate Sir John Hicks. The products granulated cane sugar and granulated beet sugar probably conform to Hicksian aggregation, because it is difficult to comprehend how the prices of such close substitutes could differ. Hicksian aggregation has the advantage that it can be examined empirically using available government price indexes: One study by Theodore Jaditz, [3] for example, employs detailed Producer Price Indexes to determine if conditions for Hicksian aggregation are met.
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> Demand relationships extend beyond close substitutes or goods whose prices move together. Cases where commodities are used together need to be included in a demand-side concept. Such relationships are sometimes called "Leontief" aggregation (from the work of another Nobel prize-winning economist, Wassily Leontief): Demand-side groupings can be formed from goods that are used in fixed relation to one another.
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> Still more general is the demand-side aggregation known as "functional aggregation." In this case, one aggregated commodities if demand patterns among them - whether

substitution or joint use- are independent of the use of other commodities. The technical condition is that demands for commodities included in a group should depend only on the prices of commodities within the group, and on consumer income (in the case of consumer goods). This form of demand-side aggregation imposes conditions that are highly technical, and that are not easy to explain in intuitive language.

Another approach to demand-side groupings is to consider marketing relationships. If commodities are commonly sold together through similar channels, some users will request that information on them be combined."

Intrinsic Nature or Physical Characteristic of the Product [4]

A second concept on which to base a product classification system is the intrinsic character of the good or service. The Central Product Classification of the United Nations defines the intrinsic nature or physical characteristic of the product in the following manner: "The expression physical properties and intrinsic nature means criteria that are proper to the goods themselves, e.g., the raw materials of which they are made, their stage of production, the way in which they are produced, the purpose or user category for which they are intended, the prices at which they are sold, whether or not they can be stored etc." [5]

Like the demand-based system, there are different approaches to developing a system based on the intrinsic nature or physical characteristics of the product. It should be noted that most of the discussion of this type of classification relates to transportable goods since the "intrinsic nature of the product" relates most easily to its physical properties that are less easily identified in a service product.

First of all, one might develop a system classifying products according to the constituent material of the good. All products made of rubber would be identified and grouped together as would all products of plastic, cotton, etc., regardless of their use. In a system such as this, yarn made from cotton, fabric made from cotton, and apparel and other textile items made of cotton would all be grouped together. Certainly, individual products such as cotton yarn, cotton fabric, and cotton apparel could be identified separately in the system, but the aggregation of these products would be into a category called products of cotton.

The Harmonized System, in some instances, uses this criteria for aggregation. For example, Chapter 39, Plastics and Articles Thereof, includes most products made primarily from plastic. However, there are exceptions with plastics footwear included with footwear, plastics furniture with furniture, and plastics jewelry with jewelry. There probably is no product classification system in use today that relies exclusively on the constituent material as its underlying framework, although the HS, as noted above, uses a variation of the concept in its product classification aggregations.

A second approach to using the intrinsic character of the product is to develop a system and group together products based on the degree of processing of the product. Such a system might be organized as follows:

- raw materials such as raw cotton or crude petroleum
- semi-finished products or goods that need further processing
- finished products (finished products can either be the final product or an intermediate product used in further production)

The HS once again provides a partial example of this type of system. Separate chapters are provided in the HS for iron ore, Chapter 26 - Ores, Slag and Ash, (raw material); iron and steel, Chapter 72 - Iron and Steel, (semi-finished products or goods that need further processing); and Chapter 73 - Articles of Iron or Steel (finished products). Once again, however, this is not a pure system as additional chapters provide for other finished products such as machinery, automobiles, and aircraft. Many of the finished products in chapter 73 are used further in the production of machinery, autos, and aircraft (an example of final products used in further production) that are included in separate HS chapters.

Industry of Origin

An industry of origin based product classification system is linked closely to the industry classification system in use. Such a system will identify the products of each industry and group those products together. A distinguishing characteristic of this system is that each product is assigned to one industry regardless of the fact that the product, in fact, might be produced by more than one industry.

In some respects, the Central Product Classification (CPC) system of the United Nations follows the industry of origin concept in its structure. The introduction to the to the CPC states that, "although not the sole criterion used, the industrial origin of goods and services was, nevertheless, considered to be important in developing the CPC. Its importance was recognized by attempting to group into one CPC subclass only those products that are produced by a single industry." [6]

The Census Bureaus's Numerical List of Manufactured Products also is an industry of origin based product system. The product codes are linked to the industry system regardless of the use or demand of the product. Cattle hides (product code 2011914), a by-product of meat slaughtering, are assigned a 2011 (SIC 2011, Meat Packing Plants; product code 2011, Fresh and Frozen Meats from Animals Slaughtered in this Plant) product code, along with primal cuts of beef (2011114) and edible tallow (2011B41). In addition, in this system the same product is assigned multiple codes to ensure the linkage to the industry of origin. For example, there are two product codes for the production of smoked sausage, 2011711, Fresh Sausage Made in Animal Slaughtering Plants, and 2013711, Fresh Sausage Made in Meat Processing Plants.

List of Products

The approaches to developing a product classification system discussed above, mostly relate to how to aggregate the products into a hierarchy. Another approach, however, to developing a product classification system is to simply create a comprehensive list of products, sort them in some described order that could be alphabetic or by degree of processing, and leave it to the data user to aggregate those products into a hierarchical structure. Therefore, if the data user is looking for the production of all types of sweeteners to determine the competition for a new sweetener product, that user could add together the data for all types of sweeteners (i.e., honey, cane sugar, beet sugar, artificial sweeteners, etc.) to produce a demand category for sweeteners. Another user might want to look at the outputs of the chemical industry and thus would want to include the product artificial sweeteners in analytical work on the chemical industry. Another user might want to compare the sweetener industry of the United States and Canada and thus might be interested in looking at the industrial structure of the industries in the two countries, including their products. That user could assign each of these products to its industry of origin (i.e., honey to NAICS 11291, Apiculture; cane sugar to NAICS 311312, Cane Sugar Refining; etc.).

Such a list would include both intermediate and final products since the output of some industries are the input of others. Steel rods are produced as an output of the steel industry and used as an input of the automobile industry. Certainly, a list of products should include both products.

Robert McGuckin, in a Census Bureau Paper titled, "Implementation of a Conceptually Based SIC System: The Importance of Consistent, Detailed Product and Materials List, including Occupation Codes," argued for this an approach. He says, " Since the basic economic data required to satisfy most user needs are derived from the inputs and outputs of geographically distinct productive units such as the establishment, if the commodity information is complete (and detailed) then any number of useful aggregation schemes can be published." [7]

A Description of Other Product Systems in Use Today

Harmonized Commodity Description and Coding System (HS) - The HS is an international commodity classification system for transportable goods, developed by the Customs Cooperation Council, to facilitate international trade. Approximately 100 countries, including the U.S., Canada, Mexico, Japan, and the European community, now use the system as a basis for classifying imports and exports of goods. The HS is arranged into 21 sections that cover broad ranges of like products.

The HS was developed primarily for use in classifying and collecting data on international transactions of transportable goods. It recognizes the requirements of legal administration by customs agencies. The organizational framework, legal texts and notes, and related elements are

organized to facilitate consistent legal interpretation. The framework is thus based on legal principals, rather than being oriented toward production patterns or a theoretical concept. The principal characteristics represented in the HS detail include:

- level or stage of processing and market general categories, such as consumer versus industrial goods and final goods versus intermediate goods versus parts. Strong emphasis is placed on distinguishing goods based on their stage or processing.

- constituent material

- use to the extent that this can be determined objectively. For example there are HS codes for machinery for making pulp, machinery for making paperboard, machines for extruding, drawing, texturing or cutting man-made textile materials, etc.

These types of characteristics are objective characteristics --those that are inherent in the goods and this system most meets the characteristics of a system based on the "intrinsic character of the good."

Central Product Classification (CPC) - The Central Product Classification system, developed and maintained by the United Nations, is a complete product classification system covering both goods and services. The purpose of the system is to provide a general framework for international linkage and comparisons of data from various types of systems such as commodity flows and the national accounts or for comparing domestic output and external trade. In particular, it can provide guidelines for collecting detail needed on domestic production of goods and services. The CPC provides a structure that countries may use as a framework for developing its own system for collection of production statistics. It provides for less detail than the HS, but yet allows for a direct link to trade statistics.

The goods portion of the CPC is an aggregation of HS detail. Each CPC goods product category is directly linked to one or more HS codes. For that reason then, the goods portion of the CPC is based on the physical properties and intrinsic nature of the product. However, it also should be noted that in aggregating the CPC categories into higher levels of grouping, the industrial origin of goods was considered to be important. "Its importance was recognized by attempting to group into one CPC subclass only those products that are produced by a single industry. However, since the criterion of industry of origin was not always taken into account in the HS, the industrial origin principle could only be applied in so far as the HS allowed it." [8]

The CPC does not specifically detail the principle used in the construction of the system for services except to say that to the extent possible grouping products together according to their industrial origin was used. Exceptions include those services provided by manufacturers that are either grouped with the type of service performed or in a special division, Division 86, Production Services on a Fee or Contract Basis. The CPC treats such manufacturing processes as apparel contracting and machine shop operations as manufacturing services.

Classification of Product by Activity (CPA) - The CPA, developed by the statistical office of the European Community (EUROSTAT), classifies products and services within the context of categories defined by their industry classification system, NACE, Rev.1. It is "a product classification whose elements are structured on the basis of the industrial origin criterion, industrial origin begin defined by NACE, Rev.1. All the products - being either transportable and non-transportable goods or services - are heretofore assigned to one and only one of the activities of NAICS, Rev.1.... Consistent with the other principles used, homogeneity within categories is maximized. CPC categories for transportable goods are based on the physical properties and the intrinsic nature of the products, as in the HS." [9]

Prodcom - Prodcom (Community Production) is a list of products used by the European Community (EC) for the collection of production statistics for mining and quarrying, manufacturing, and electricity, gas, and water supply. The Prodcom products are based on system used by the EC for external trade statistics, making this system essentially an HS based system.

Standard Classification of Goods - This Canadian classification system for transportable goods is used for the collection of domestic production of manufactured goods. It is based entirely on the HS.

Standard Classification of Transported Goods - The Standard Classification of Transported Goods (SCTG) was developed by Canada and the United States for use in the 1997 U.S. Commodity Flow Survey and to ensure comparable transportation statistics between the two countries. It "consists of a blend of transportation characteristics, commodity similarities, and industry-of-origin considerations, designed to create statistically significant (product) categories. It is a structured list that is defined at its less-detailed levels according to the Harmonized Commodity Description and Coding System(HS), and at more detailed levels, according to patterns of industrial activity. Other factors in the definition of categories were transportation considerations such as volume, revenue, value, origin, and destination." [10]

Users and Uses of Product Data (this section to be more fully developed by individual contributions from ECPC member agencies)

To determine the conceptual framework for a product system, one must first look at the users of product information. Unfortunately, they are many and varied and often times at odds with one another.

There is a large body of data users in the market research community that use product information to determine market share, shifts in consumer demand, location of sales offices and territories, etc. Trade associations and individual businesses rely heavily on Government product data in their business planning decisions. Demand-based aggregations of products are most useful for this body of users.

Trade analysis is another important use of product data by both private and public policy makers. Comparison of imports and exports to domestic production is critical to determining the impact of imports and exports on the domestic economy. Without detailed domestic product information, it is not possible to calculate apparent consumption of products, nor is it possible to determine if unfair trading practices are occurring. The Harmonized System is used to collect and publish information on imports and exports of transportable goods while the Central Product Classification system is the standard used worldwide for the collection of product data in service industries.

With the development of NAICS, it would be desirable to develop a product system in cooperation with Canada and Mexico to ensure complete comparability of all statistics with our NAFTA trading partners. It became obvious during the development of NAICS that industries among the three countries were structured differently. Therefore, analysts comparing statistics across the three countries need comparable product information to complete the picture of the three economies.

Detailed product information also is needed to construct price indices. A major use of the Census Bureau's extensive list of manufactured products is the construction of the Producer Price Index. Detailed product information also is used in conjunction with the inputs of industries to construct the input/output tables of the United States. The Bureau of Economic Analysis relies heavily on the detailed product information provided by the Census Bureau for the input/output tables, construction of the national accounts, and estimates of Gross Domestic Product. Finally, the Federal Reserve Board relies on detailed product information to construct its indexes of production.

Advantages and Disadvantages of Each Type of System

These competing uses of product data present a difficult dilemma for developing a product classification system. *A single conceptual framework for developing a product system would provide all of the benefits that the production based NAICS does.* Some of these benefits were outlined in the original ECPC Issues Paper 1, Conceptual Issues and are as follows:

> "Without a consistent economic concept for grouping and classifying data, users will find that the data are not always grouped appropriately for any purpose. Inconsistencies arise in the system, and users may not know where they are.....Equally important, without a consistent economic concept, whoever constructs a classification system must inevitably choose from among competing requirements.... In presenting the system to the public, an economic concept facilitates explaining why data are grouped in one way rather than in another. Without a consistent concept, the system as a whole cannot be understood by users, which leads not only to inadvertent misuse of the data, but also to controversies and criticisms that arise from misunderstandings." [11]

A demand-based system would complement the supply- or production- based industry system NAICS, just adopted by the United States and its NAFTA trading partners. Identifying and aggregating detailed products of both goods and service producing industries into demand-based categories based on product substitution or end use would provide users the information necessary to compute market share and prepare market studies.

A system based on the physical characteristics of the product or the intrinsic nature of the product would produce information similar to the HS. An HS-based would provide critically needed data for analysis of foreign trade on the domestic market. Such a system, however, would probably not satisfy those users of product data concerned with market studies unless demand aggregations could be constructed from the individual product codes.

A true industry of origin based system is difficult to construct and maintain. Competing products and products that look alike can be produced in different industries. We see this in the fresh sausage example noted earlier. However, this problem is not limited to manufacturing. The same health services can be provided by an HMO (NAICS 6214191), a doctor's office (NAICS 621111), and a hospital (NAICS 62211). Candy bars can be sold by gasoline service stations, grocery stores, candy stores, warehouse clubs, etc. Do we create a "candy bar" product code for each of these "industries of origin" or pick one and assign all candy bar sales to that industry, ignoring sales generated in other industries.

A straight list of products arranged in some logical sequence is appealing. Analysts would then be free to reaggregate the data into whatever format that would best serve the purpose to which the data are being used. The drawback to this alternative is that there is no official aggregation so data collected and published across Federal agencies would not be comparable. Productivity measures might be based on one aggregation while the Census Bureau was using another in publishing its product detail. Providing an "official" aggregation scheme should be one objective of the new system.

1. Federal Register, Vol 59, No. 142, Tuesday, July 26, 1994, pp. 38094.

2. Ibid.

3. Jaditz, Theodore, "Economic Markets and the Standard Industrial Classification, Bureau of Labor Statistics Working Paper 205, November 1991.

4. Much of the discussion in this section is based on an internal publication of Eurostat, "The Harmonized Commodity Description and Coding System, Current Situation and Consideration," by Michael Lux.

5. Provisional Central Product Classification, Series M, No. 77, United Nations, New York, 1991.

6. Ibid

7. Implementation of a Conceptually Based SIC System: The Importance of Conssitent, Detailed Product and Materials Lists, Including Occupation Codes, Robert H. McGuckin, Census Bureau Paper.

8. Ibid

9. Introduction to CPA, Working document for the Mini-NACE meeting in London, September 1992.

10. Standard Classification of Transported Goods (SCTG), Statistics Canada, October 1996.

11. Federal Register, Vol 58, No. 60, Wednesday, March 31, 1994, pp. 16996